

DOCUMENTATION OF ENVIRONMENTAL INDICATOR DETERMINATION

Interim Final 2/5/99

RCRA Corrective Action Environmental Indicator (EI) RCRIS code (CA 725)

Current Human Exposures Under Control

Facility Name: Boeing Plant 2.
Facility Address: 7755 East Marginal Way, Seattle, WA
Facility EPA ID #: WAD 00925 6819

1. Has **all** available relevant/significant information on known and **reasonably suspected** releases to soil, groundwater, surface water/sediments, and air, subject to RCRA Corrective Action (e.g., from Solid Waste Management Units (SWMU), Regulated Units (RU), and Areas of Concern (AOC)), been **considered** in this EI determination?

 X If yes – check here and continue with #2 below.

 If no – re-evaluate existing data, or

 If data are not available skip to #6 and enter “IN” (more information needed) status code.

BACKGROUND

Definition of Environmental Indicators (for the RCRA Corrective Action)

Environmental Indicators (EI) are measures being used by the RCRA Corrective Action program to go beyond programmatic activity measures (e.g., reports received and approved, etc.) to track changes in the quality of the environment. The two EI developed to-date indicate the quality of the environment in relation to current human exposures to contamination and the migration of contaminated groundwater. An EI for non-human (ecological) receptors is intended to be developed in the future.

Definition of “Current Human Exposures Under Control” EI

A positive “Current Human Exposures Under Control” EI determination (“YE” status code) indicates that there are no “unacceptable” human exposures to “contamination” (i.e., contaminants in concentrations in excess of appropriate risk-based levels) that can be reasonably expected under current land- and groundwater-use conditions (for all “contamination” subject to RCRA corrective action at or from the identified facility (i.e., site-wide)).

Relationship of EI to Final Remedies

While Final remedies remain the long-term objective of the RCRA Corrective Action program the EI are near-term objectives which are currently being used as Program measures for the Government Performance and Results Act of 1993 (GPRA). The “Current Human Exposures Under Control” EI are for reasonably expected human exposures under current land- and groundwater-use conditions ONLY, and do not consider potential future land- or groundwater-use conditions or ecological receptors. The RCRA Corrective Action program’s overall mission to protect human health and the environment requires that Final remedies address these issues (i.e., potential future human exposure scenarios, future land and groundwater uses, and ecological receptors).

Duration/Applicability of EI Determinations

EI Determinations status codes should remain in RCRIS national database ONLY as long as they remain true (i.e., RCRIS status codes must be changed when the regulatory authorities become aware of contrary information).

2. Are groundwater, soil, surface water, sediments, or air **media** known or reasonably suspected to be “contaminated”¹ above appropriately protective risk-based “levels” (applicable promulgated standards, as well as other appropriate standards, guidelines, guidance, or criteria) from releases subject to RCRA corrective action (from SWMUs, RUs, or AOCs)?

	<u>Yes</u>	<u>No</u>	<u>Unkn</u>	<u>Rationale/Key Contaminants</u>
Groundwater	<u>X</u>	—	—	VOCs, PCBs, Metals
Air (indoors) ²	—	—	<u>X</u>	See below comment
Surface Soil (e.g., <2 ft)	<u>X</u>	—	—	Several contaminants known to be in surface soil above MTCA industrial standards.
Surface Water	—	—	<u>X</u>	See below comment.
Sediment	<u>X</u>	—	—	Several contaminants known to be in sediment above Washington State Sediment Management Standards including (but not limited to) PCBs and metals.
Sub-Surface Soil (e.g., >2 ft)	<u>X</u>	—	—	Several contaminants known to be in sub-surface soil above MTCA industrial standards.
Air (outdoors)	—	<u>X</u>	—	

— If no (for all media) – skip to #6, and enter “YE,” status code after providing or citing appropriate “levels,” and referencing sufficient supporting documentation demonstrating that these “levels” are not exceeded.

X If yes (for any media) – continue after identifying key contaminants in each “contaminated” medium, citing appropriate “levels” (or provide an explanation for the determination that the medium could pose an unacceptable risk), and referencing supporting documentation.

— If unknown (for any media) – skip to #6 and enter “IN” status code.

Rationale and Reference(s):

Groundwater: Several contaminants, to include VOCs, PCBs, metals identified above appropriate Washington State Model Toxics Control Act (MTCA) risk based cleanup levels. References include *Technical Memorandum – SWMU/AOC/AO-Specific Data Presentation RCRA Corrective Measures Study Volume I-III*, Roy F. Weston, Inc., April 2000, *CMS Phase Quarterly Shoreline Groundwater Monitoring Report, February 2005, Boeing Plant 2, Seattle/Tukwila, Wa*, Environmental Partners, Inc., April 20, 2005, and *CMS Phase Quarterly Shoreline Groundwater Monitoring Report, May 2005, Boeing Plant 2, Seattle/Tukwila, Wa*, Environmental Partners, Inc., August 3, 2005

Surface Soil (sub-surface and surface): Several contaminants to include VOCs, SVOCs, PCBs, and metals are known to be in surface soil above MTCA industrial standards. References include *SWMU/AOC/AO-Specific Data Presentation RCRA Corrective Measures Study Volume I-III*, Roy F. Weston, Inc., April 2000, *Uplands Corrective Measures Study Volume III: South Yard Area Data Gap Investigation Report (DRAFT)*, Environmental Partners, Inc., August 2005.

Sediment: Several contaminants, including PCBs and metals are known to be in sediment above Washington State Sediment Management Standards. References include *RCRA Facility Investigation, Duwamish Waterway Sediment Investigation, Volume II*, October 1996, *Focused Corrective Measures Study Report-Duwamish Sediment Other Area*, 1999, *Alternative Corrective Measures Evaluation Report*, November 2001, *South Plant 2 and Jorgensen Forge Area Geospatial Analysis*, May 2005.

Notes:

- 1 “Contamination” and “contaminated” describes media containing contaminants (in any form, NAPL and/or dissolved, vapors, or solids, that are subject to RCRA) in concentrations in excess of appropriately protective risk-based “levels” (for the media, that identify risks within the acceptable risk range).
- 2 Recent evidence (from the Colorado Dept. of Public Health and Environment, and others) suggest that unacceptable indoor air concentrations are more common in structures above groundwater with volatile contaminants than previously believed. This is a rapidly developing field and reviewers are encouraged to look to the latest guidance for the appropriate methods and scale of demonstration necessary to be reasonably certain that indoor air (in structures located above (and adjacent to) groundwater with volatile contaminants) does not present unacceptable risks.

3. Are there **complete pathways** between “contamination” (verified or reasonably suspected) and human receptors such that exposures can be reasonably expected under the current (land- and groundwater-use) conditions?

Summary Exposure Pathway Evaluation Table

Potential **Human Receptors** (Under Current Conditions)

“Contaminated” Media	Residents	Workers	Day-Care	Construction	Trespassers	Recreation	Food ³
Groundwater							
Air (indoors)							
Soil (surface, e.g., <2 ft)							
Surface Water							
Sediment		<u> X </u>			<u> X </u>	<u> X </u>	<u> X </u>
Soil (subsurface e.g., >2 ft)				<u> X </u>			
Air (outdoors)							

Instructions for Summary Exposure Pathway Evaluation Table:

1. Strike-out specific Media including Human Receptors’ spaces for Media which are not “contaminated” as identified in #2 above.
2. Enter “yes” or “no” for potential “completeness under each “Contaminated” Media – Human Receptor combination (Pathway).

Note: In order to focus the evaluation to the most probable combinations some potential “Contaminated” Media – Human Receptor combinations (Pathways) do not have check spaces (“___”). While these combinations may not be probable in most situations they may be possible in some settings and should be added as necessary.

- _____ If no (pathways are not complete for any contaminated media-receptor combinations) – skip to #6 and enter “YES” status code, after explaining and/or referencing condition(s) in-place, whether natural or man-made, preventing a complete exposure pathway from each contaminated medium (e.g., use optional Pathway Evaluation Work Sheet to analyze major pathways).
- X If yes (pathways are complete for any “Contaminated” Media – Human Receptor combination) – continue after providing supporting explanation.
- _____ If unknown (for any “Contaminated” Media – Human Receptor combination) – skip to #6 and enter “IN” status code.

Rationale and Reference(s): This facility is located on, and contamination discharges into, the Duwamish Waterway. There are known recreational and subsistence users of the Waterway, including American Indians with treaty fishing rights and Asian-Pacific Islanders known to harvest fish, shellfish, and seaweed for consumption. Concentrations of COCs in the surface water do not pose a risk to recreational users from contact with water, but COCs may bioaccumulate

in fish and shellfish and pose risks for tribal and subsistence fishers. Site workers and construction workers are also present on-site and could encounter contaminated media during construction projects.

³ Indirect Pathway/Receptor (e.g., vegetables, fruits, crops, meat and dairy products, fish, shellfish, etc.)

4. Can the **exposures** from any of the complete pathways identified in #3 be reasonably expected to be “**significant**”⁴ (i.e. potentially “unacceptable” because exposures can be reasonably expected to be: 1) greater in magnitude (intensity, frequency, and/or duration) than assumed in the derivation of the acceptable “levels” (used to identify the “contamination”); or 2) the combination of exposure magnitude (perhaps even though low) and contaminant concentrations (which may be substantially above the acceptable “levels”) could result in greater than acceptable risks?

_____ If no (exposures can not be reasonably expected to be significant (i.e., potentially “unacceptable”) for any complete exposure pathway) – skip to #6 and enter “YE” status code after explaining and/or referencing documentation justifying why the exposures (from each of the complete pathways) to “contamination” (identified in #3) are not expected to be “significant.”

 X If yes (exposures could reasonably be expected to be “significant” (i.e., potentially “unacceptable”) for any complete exposure pathway) – continue after providing a description (of each potentially “unacceptable” exposure pathway) and explaining and/or referencing documentation justifying why the exposures (from each of the remaining complete pathways) to “contamination” (identified in #3) are expected to be “significant.”

_____ If unknown (for any complete pathway) – skip to #6 and enter “IN” status code.

Rationale and Reference(s): Areas of surficial soil contamination exceeding applicable MTCA industrial standards are known to exist on site. There are areas of contaminated sediments along the Duwamish Waterway.

There are several contaminants of concern regarding the contaminated groundwater/surface water/sediment pathway, due to fishing and recreational uses of the Waterway. COCs above screening levels include metals, PCBs, and VOCs within the groundwater that discharges to the Duwamish Waterway and within the soil and sediments associated with this site.

⁴ If there is any question on whether the identified exposures are “significant” (i.e., potentially “unacceptable”) consult a human health Risk Assessment specialist with appropriate education, training and experience.

5. Can the “significant” **exposures** (identified in #4) be shown to be within **acceptable** limits?

_____ If yes (all “significant” exposures have been shown to be within acceptable limits) – continue and enter “YE” after summarizing and referencing documentation justifying why all “significant” exposures to “contamination” are within acceptable limits (e.g., a site-specific Human Health Risk Assessment).

 X If no (there are current exposures that can be reasonably expected to be “unacceptable”) – continue and enter “NO” status code after providing a description of each potentially “unacceptable” exposure.

_____ If unknown (for any potentially “unacceptable” exposure) – continue and enter “IN” status code.

Rationale and Reference(s): *See above.*

**Current Human Exposures Under Control
Environmental Indicator (EI) RCRIS code (CA 725)**

Facility Name: Boeing Plant 2.
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Facility EPA ID #: WAD 00925 6819

6. Check the appropriate RCRIS status codes for the Current Human Exposures Under Control EI event code (CA 725) and obtain Supervisor (or appropriate Manager) signature and date on the EI determination below (and attach appropriate supporting documentation as well as a map of the facility):

 YE – Yes, “Current Human Exposures Under Control” has been verified. Based on a review of the information contained in this EI Determination, “Current Human Exposures” are expected to be “Under Control” under current and reasonably expected conditions. This determination will be re-evaluated when the Agency/State becomes aware of significant changes at the facility.

 X NO – “Current Human Exposures” are NOT “Under Control.”

 IN – More information is needed to make a determination.

Completed by: /s/ Shawn Blocker Date 6-08-2006
RCRA Corrective Action Project Manager

Supervisor: /s/ Rick Albright Date _____
Director, Office of Air, Waste and Toxics
EPA Region 10

Narrative including locations where References may be found:

See facility file and administrative record located at EPA Region 10, Seattle WA.

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FINAL NOTE: THE HUMAN EXPOSURES EI IS A QUALITATIVE SCREENING OF EXPOSURES AND THE DETERMINATIONS WITHIN THIS DOCUMENT SHOULD NOT BE USED AS THE SOLE BASIS FOR RESTRICTING THE SCOPE OF MORE DETAILED (E.G., SITE-SPECIFIC) ASSESSMENTS OF RISK.

DOCUMENTATION OF ENVIRONMENTAL INDICATOR DETERMINATION

Interim Final 2/5/99

RCRA Corrective Action Environmental Indicator (EI) RCRIS code (CA 750)

Migration of Contaminated Groundwater Under Control

Facility Name: Boeing Plant 2.
Facility Address: 7755 East Marginal Way, Seattle, WA
Facility EPA ID #: WAD 00925 6819

1. Has **all** available relevant/significant information on known and reasonably suspected releases to the groundwater media, subject to RCRA Corrective Action (e.g., from Solid Waste Management Units (SWMU), Regulated Units (RU), and Areas of Concern (AOC)), been **considered** in this EI determination?
- X If yes – check here and continue with #2 below.
 If no – re-evaluate existing data, or
 if data are not available, skip to #8 and enter “IN” (more information needed) status code.

BACKGROUND

Definition of Environmental Indicators (for the RCRA Corrective Action)

Environmental Indicators (EI) are measures being used by the RCRA Corrective Action program to go beyond programmatic activity measures (e.g., reports received and approved, etc.) to track changes in the quality of the environment. The two EI developed to-date indicate the quality of the environment in relation to current human exposures to contamination and the migration of contaminated groundwater. An EI for non-human (ecological) receptors is intended to be developed in the future.

Definition of “Migration of Contaminated Groundwater Under Control” EI

A positive “Migration of Contaminated Groundwater Under Control” EI determination (“YE” status code) indicates that the migration of “contaminated” groundwater has stabilized, and that monitoring will be conducted to confirm that contaminated groundwater remains within the original “area of contaminated groundwater” (for all groundwater “contamination” subject to RCRA corrective action at or from the identified facility (i.e., site-wide)).

Relationship of EI to Final Remedies

While Final remedies remain the long-term objective of the RCRA Corrective Action program the EI are near-term objectives which are currently being used as Program measures for the Government Performance and Results Act of 1993 (GPRA). The “Migration of Contaminated Groundwater Under Control” EI pertains **ONLY** to the physical migration (i.e., further spread) of contaminated groundwater and contaminants within groundwater (e.g., non-aqueous phase liquids or NAPLs). Achieving this EI does not substitute for achieving other stabilization or final remedy requirements and expectations associated with sources of contamination and the need to restore, wherever practicable, contaminated groundwater to be suitable for its designated current and future uses.

Duration/Applicability of EI Determinations

EI Determinations status codes should remain in RCRIS national database **ONLY** as long as they remain true (i.e., RCRIS status codes must be changed when the regulatory authorities become aware of contrary information).

2. Is **groundwater** known or reasonably suspected to be “**contaminated**”¹ above appropriately protective “levels” (i.e., applicable promulgated standards, as well as other appropriate standards, guidelines, guidance, or criteria) from releases subject to RCRA Corrective Action, anywhere at, or from, the facility?

 X If yes – continue after identifying key contaminants, citing appropriate “levels,” and referencing supporting documentation.

 If no – skip to #8 and enter “YE” status code, after citing appropriate “levels,” and referencing documentation to demonstrate that groundwater is not “contaminated.”

 If unknown – skip to #8 and enter “IN” status code.

Rationale and References *Comprehensive RCRA Facility Investigation Report (Weston 1998) and associated referenced documents. CMS Phase Quarterly Shoreline Groundwater Monitoring Reports for 12/2003, 2/2204 and 5/2004 and 8/2004; Data Gaps Work Plans, 2005.*

Screening levels include protection of aquatic species and human exposure to groundwater, air, and fish consumption. The most conservative pathway for many chemicals assumes that chemicals move from groundwater to surface water and sediment to fish to human consumption without dilution or degradation and bioaccumulation in fish that are then consumed by humans. Key contaminants that have been detected above screening levels within the groundwater include PCB’s, arsenic, copper, cadmium, mercury, nickel, selenium, silver, several SVOC’s, benzene, and TCE and its degradation products

Notes: ¹ “Contamination” and “contaminated” describes media containing contaminants (in any form, NAPL and/or dissolved, vapors, or solids, that are subject to RCRA) in concentrations in excess of appropriate “levels” (appropriate for the protection of the groundwater resource and its beneficial uses)

3. Has the **migration** of contaminated groundwater **stabilized** (such that contaminated groundwater is expected to remain within the “existing area of contaminated groundwater”² as defined by the monitoring locations designated at the time of this determination)?

 If yes – continue, after presenting or referencing the physical evidence (e.g., groundwater sampling/measurement/migration barrier data) and rationale why contaminated groundwater is expected to remain within the (horizontal or vertical) dimensions of the “existing area of groundwater contamination”²).

 X If no (contaminated groundwater is observed or expected to migrate beyond the designated locations defining the “existing area of groundwater contamination”²) – skip to #8 and enter “NO” status code, after providing an explanation.

 If unknown – skip to #8 and enter “IN” status code.

Rationale and Reference(s): see above.

Notes: ² “existing area of contaminated groundwater” is an area (with horizontal and vertical dimensions) that has been verifiably demonstrated to contain all relevant groundwater contamination for this determination, and is defined by designated (monitoring) locations proximate to the outer perimeter of “contamination” that can and will be sampled/tested in the future to physically verify that all “contaminated” groundwater remains within this area, and that the further migration of “contaminated” groundwater is not occurring. Reasonable allowances in the proximity of the monitoring locations are permissible to incorporate formal remedy decisions (i.e., including public participation) allowing a limited area for natural attenuation.

4. Does “contaminated” groundwater **discharge** into **surface water** bodies?

_____ If yes – continue after identifying potentially affected surface water bodies.

_____ If no – skip to #7 (and enter a “YE” status code in #8, if #7 = yes) after providing an explanation and/or referencing documentation supporting that groundwater “contamination” does not enter surface water bodies.

_____ If unknown – skip to #8 and enter “IN” status code.

Rationale and Reference(s): As stated in #3, COC’s above screening levels are discharging into the Duwamish Waterway.

5. Is the **discharge** of “contaminated” groundwater into surface water likely to be “**insignificant**” (i.e., the maximum concentration³ of each contaminant discharging into surface water is less than 10 times their appropriate groundwater “level,” and there are no other conditions (e.g., the nature, and number, of discharging contaminants, or environmental setting), which significantly increase the potential for unacceptable impacts to surface water, sediments, or eco-systems at these concentrations)?

_____ If yes – skip to #7 (and enter “YE” status code in #8 if #7 = yes), after documenting: 1) the maximum known or reasonably suspected concentration³ of key contaminants discharged above their groundwater “level,” the value of the appropriate “level(s),” and if there is evidence that the concentrations are increasing; and 2) provide a statement of professional judgment/explanation (or reference documentation) supporting that the discharge of groundwater contaminants into the surface water is not anticipated to have unacceptable impacts to the receiving surface water, sediments, or eco-system.

_____ If no – (the discharge of “contaminated” groundwater into surface water is potentially significant) – continue after documenting: 1) the maximum known or reasonably suspected concentration³ of each contaminant discharged above its groundwater “level,” the value of the appropriate “level(s),” and if there is evidence that the concentrations are increasing; and 2) for any contaminants discharging into surface water in concentrations³ greater than 100 times their appropriate groundwater “levels,” the estimated total amount (mass in kg/year) of each of these contaminants that are being discharged (loaded) into the surface water body (at the time of the determination), and identify if there is evidence that the amount of discharging contamination is increasing.

_____ If unknown – enter “IN” status code in #8.

Rationale and Reference(s):

³ As measured in groundwater prior to entry to the groundwater-surface water/sediment interaction (e.g., hyporheic) zone.

6. Can the **discharge** of “contaminated” groundwater into surface water be shown to be “**currently acceptable**” (i.e., not cause impacts to surface water, sediments or eco-systems that should not be allowed to continue until a final remedy decision can be made and implemented⁴)?

_____ If yes – continue after either: 1) identifying the Final Remedy decision incorporating these conditions, or other site-specific criteria (developed for the protection of the site’s surface water, sediments, and eco-systems), and referencing supporting documentation demonstrating that these criteria are not exceeded by the discharging groundwater; OR 2) providing or referencing an interim-assessment⁵, appropriate to the potential for impact, that shows the discharge of groundwater contaminants into the surface water is (in the opinion of a trained specialist, including ecologists) adequately protective of receiving surface water, sediments, and eco-systems, until such time when a full assessment and final remedy decision can be

made. Factors which should be considered in the interim-assessment (where appropriate to help identify the impact associated with discharging groundwater) include: surface water body size, flow, use/classification/habitats and contaminant loading limits, other sources of surface water/sediment contamination, surface water and sediment sample results and comparisons to available and appropriate surface water and sediment “levels,” as well as any other factors, such as effects on ecological receptors (e.g., via bio-assays/benthic surveys or site-specific ecological Risk Assessments), that the overseeing regulatory agency would deem appropriate for making the EI determination.

_____ If no – (the discharge of “contaminated” groundwater can not be shown to be “**currently acceptable**”) – skip to #8 and enter “NO” status code, after documenting the currently unacceptable impacts to the surface water body, sediments, and/or eco-systems.

_____ If unknown – skip to 8 and enter “IN” status code.

Rationale and Reference(s):

⁴ Note, because areas of inflowing groundwater can be critical habitats (e.g., nurseries or thermal refugia) for many species, appropriate specialist (e.g., ecologist) should be included in management decisions that could eliminate these areas by significantly altering or reversing groundwater flow pathways near surface water bodies.

⁵ The understanding of the impacts of contaminated groundwater discharges into surface water bodies is a rapidly developing field and reviewers are encouraged to look to the latest guidance for the appropriate methods and scale of demonstration to be reasonably certain that discharges are not causing currently unacceptable impacts to the surface waters, sediments, or eco-systems.

7. Will groundwater **monitoring**/measurement data (and surface water/sediment/ecological data, as necessary) be collected in the future to verify that contaminated groundwater has remained within the horizontal (or vertical, as necessary) dimensions of the “existing area of contaminated groundwater?”

_____ If yes – continue after providing or citing documentation for planned activities or future sampling/measurement events. Specifically identify well/measurement locations which will be tested in the future to verify the expectation (identified in #3) that groundwater contamination will not be migrating horizontally (or vertically, as necessary) beyond the “existing area of groundwater contamination.”

_____ If no – enter “NO” status code in #8.

_____ If unknown – enter “IN” status code in #8.

Rationale and Reference(s): Quarterly groundwater monitoring for all COC’s is currently on-going.

**Migration of Contaminated Groundwater Under Control
Environmental Indicator (EI) RCRIS code (CA 750)**

Facility Name: Boeing Plant 2.
Facility Address: 7755 East Marginal Way, Seattle, WA
Facility EPA ID #: WAD 00925 6819

8. Check the appropriate RCRIS status codes for the Migration of Contaminated Groundwater Under Control EI (event code CA750), and obtain Supervisor (or appropriate Manager) signature and date on the EI determination below (attach appropriate supporting documentation as well as a map of the facility).

 YE – Yes, “Migration of Contaminated Groundwater Under Control” has been verified. Based on a review of the information contained in this EI determination, it has been determined that the “Migration of Contaminated Groundwater” is “Under Control.” Specifically, this determination indicates that the migration of “contaminated” groundwater is under control, and that monitoring will be conducted to confirm that contaminated groundwater remains within the “existing area of contaminated groundwater.” This determination will be re-evaluated when the Agency becomes aware of significant changes at the facility.

 NO – Unacceptable migration of contaminated groundwater is observed or expected.

 X IN – More information is needed to make a determination.

Completed by: /s/ Shawn Blocker Date 6/08/2006
RCRA Corrective Action Project Manager

Supervisor: /s/ Rick Albright Date
Director, Office of Air, Waste and Toxics
EPA Region 10

Narrative including locations where References may be found:

See facility file and administrative record located at EPA Region 10, Seattle, Wa.

Contact telephone and e-mail numbers

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